IMPULSIVE-ANALYTIC DISPOSITION: INSTRUMENT PILOT-TESTING

Kien Lim
University of Texas at El Paso
kienlim@utep.edu

Osvaldo F. Morera
University of Texas at El Paso
omorera@utep.edu

The likelihood-to-act (LtA) survey measures impulsive and analytic dispositions in solving mathematics problems. The current version has 16 impulsive and 16 analytic items. Its validity was assessed using a sample of 27 in-service and 92 pre-service teachers. Both the impulsive and analytic subscales were found to have internal consistency reliability, but they were not correlated with one another. The impulsive subscale was predictive of correctness in classifying the LtA items. The analytic subscale was predictive of how well a participant would perform in Part 2 of a math test after taking Part 1 and being warned that some items could be tricky.

Many pre-service teachers for elementary and middle grades appear to have an *impulsive disposition*—a proclivity to spontaneously proceed with an action that comes to mind without analyzing the problem situation and without considering the relevance of the anticipated action to the problem situation (Lim, 2006). For example, Lim (2009) found that 22 out of 28 pre-service middle-school teachers used the same strategy to solve two superficially-similar but structurally-different problems.

As mathematics educators, we want to help students advance from impulsive disposition to *analytic disposition*—where one analyzes the problem situation (Lim, 2006). An instrument that can identify problem-solving disposition will be valuable to both students and teachers. With this purpose in mind, we developed the likelihood-to-act survey (LtA). Based on our analyses of the data collected using the original 18-item version (Lim, Morera, & Tchoshanov, 2009), we increased the number of items from 18 to 32 and revised some of them. To establish the validity of this enhanced version, we developed and administered an open-ended questionnaire, a classification exercise, and a multiple-choice mathematics test.

Constructs Related to Impulsive-Analytic Disposition

Impulsive disposition can be viewed from various perspectives. From a cognitive perspective, impulsive disposition is related to the *Einstellung effect*—the phenomenon of solving a given problem in a fixated manner even when a better approach exists (Luchins, 1942). Ben-Zeev and Star (2001) used the term *spurious correlation* to account for students' association-based behavior: "when a student perceives a correlation between an irrelevant feature in a problem and the algorithm used for solving that problem and then proceeds to execute the algorithm when detecting the feature in a different problem" (p. 253). Einstellung effect, spurious correlation, and impulsive disposition emphasize different aspects of the same phenomenon: (a) Einstellung effect refers to a mental fixation, (b) spurious correlation refers to a feature-algorithm association, and (c) impulsive disposition refers to a cognitive tendency.

From a problem-solving perspective, problem-solving disposition is related to metacognition. Actively monitoring one's progress in relation to a goal is an indicator of analytic disposition. Impulsive disposition, on the other hand, is inferred when students "read, make a decision quickly, and pursue that direction come hell or high water" (Schoenfeld, 1992, p. 356). We consider impulsive disposition to be an externalization of certain beliefs such as "there is only one correct way to solve any mathematics problem—usually the rule the teacher has most

Wiest, L. R., & Lamberg, T. (Eds.). (2011). Proceedings of the 33rd Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Reno, NV: University of Nevada, Reno.

recently demonstrated to the class" (p. 359).

From a psychological perspective, impulsive disposition can be viewed as a personality trait. Kagan et al. (1964) regard a child as (a) *impulsive* if the child responds to a question with an inaccurate answer but in a short response time, and (b) *reflective* if the child has an accurate answer but long response time. Nietfeld and Bosma (2003) found that college students' impulsive-reflective style is consistent across three types of tasks: verbal, mathematical, and spatial.

From a teaching-learning perspective, impulsive-analytic disposition can be viewed as *ways of thinking* (Harel, 2008) or *habits of mind* (Cuoco, Goldenberg, & Mark, 1996). In addition to helping students develop mathematical understanding, teachers can help students to develop desirable habits of mind such as being analytic in solving a problem instead of being impulsive by applying the first idea that comes to mind. Self-awareness is a crucial first step towards transforming habits of mind from undesirable to desirable. A way to create awareness is to have an instrument that can accurately assess one's own impulsive-analytic disposition.

Means to Assess Impulsive-Analytic Disposition

A reliable way to investigate students' problem solving behaviors is through task-based interviews (Clement, 2000; Goldin, 1998) and think-aloud protocols (Ericsson & Simon, 1993). Ways of thinking such as impulsive anticipation and analytic anticipation can be identified from the analysis of students' responses to interview tasks (see Lim, 2006). Although well-suited for uncovering problem-solving disposition in individual students, this mode of data collection is not practical for large-scale assessment of students' problem-solving disposition.

Well-designed mathematical problems can be an effective and efficient means to assess impulsive-analytic disposition. Frederick (2005) designed a three-item test for assessing cognitive reflection. One of the items is: "A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?" (p. 27). The most common wrong answer, 10 cents, is considered impulsive. A reflective person, on the other hand, is likely to realize that the difference between $1.00 and 10 cents is not $1.00 but 90 cents. Other problems, such as missing-value problems involving non-proportional situations, can also be used to elicit impulsive behaviors.

An efficient way to measure cognitive and psychological constructs is through the use of questionnaire. For example, the *Need for Cognition Scale* (NfCS; Cacioppo & Petty, 1982) measures one's desire to engage in a complex thought. In the context of mathematics problem solving, Lim et al. (2009) developed the LtA survey to measure problem-solving disposition along the impulsive-analytic dimension. The LtA survey consists of six-point Likert items where participants are asked to indicate how likely they are to respond to a given mathematical problem in the described manner. The LtA survey, like most Likert-scale questionnaires, can be used for self-assessment.

The purpose of our study was two-fold. First, we sought to improve internal consistency reliability by lengthening the LtA survey to a 32-item measure. We then examined the validity of the LtA survey by determining whether the LtA scores were related to accuracy in classifying the LtA items and performance on a two-part mathematics test.

Method

Participants

There were three groups of participants: (a) 27 in-service teachers and 10 pre-service teachers in a program for improving mathematics and science education in El Paso; (b) two mathematics classes for pre-service EC-8 (Early Childhood to Grade 8) teachers with 33 and 22 students respectively; and (c) one class of 27 pre-service EC-8 teachers. Because this round of data collection was designed for testing and piloting the instruments, a convenience sample of in-service teachers was used. Data collection involving the first group was integrated into a 2.5-hour lesson on problem-solving disposition. The participants first took the LtA survey and an open-ended questionnaire. They then experienced their own problem-solving disposition via a three-problem activity involving clickers which are remote units for a personal response system that records student responses. They were introduced to impulsive and analytic dispositions via a PowerPoint Presentation and were then asked to classify each of the 32 LtA items based on whether they considered the act described in the item analytic or impulsive. The activities for the second group of participants differed slightly from that for the first group in that the three-problem clicker activity was excluded because of shorter class time. The third group of participants took the LtA survey and the two-part math test.

Instruments

Likelihood-to-Act survey. The current version of the LtA survey has four categories: algebra, fraction, word problem, and non-mathematically-specific description. In each category there are four impulsive items and four analytic items. A pair of items for each category is presented below.

aA3 $(x-7)(x-4)=0$. When asked to solve for x, how likely are you to study the equation and predict the solution? [*analytic, algebra*]

iA3 $(x-5)(x-8)=0$. When asked to solve for x, how likely are you to multiply out the terms (i.e., FOIL) and then solve $x^2-13x+40=0$ using the quadratic formula? [*impulsive, algebra*]

aF1 $\frac{3}{5}+\frac{11}{12}+\frac{1}{12}\frac{3}{5}+\frac{11}{12}+\frac{1}{12}$. When asked to find the answer for the above arithmetic expression without using a calculator, how likely are you to begin by studying the fractions to see if you can predict the answer? [*analytic, fraction*]

iF1 $\frac{3}{4}+\frac{1}{10}+\frac{9}{10}\frac{3}{4}+\frac{1}{10}+\frac{9}{10}$. When asked to find the answer for the above arithmetic expression without using a calculator, how likely are you to begin by finding the common denominator? [*impulsive, fraction*]

aW3 Paula is cycling from home to school. At 8 o'clock she has already cycled 2.4 miles. When asked to find her rate of cycling, how likely are you to analyze the problem situation instead of dividing 2.4 by 8? [*analytic, word problem*]

iW3 Jimmy is walking from home to school. At 7 o'clock he has already walked 1.4 km. When asked to find his rate of walking, how likely are you to use the $d = rt$ or $r = d/t$ relationship and obtain 0.2 km/hour? [*impulsive, word problem*]

aG1 In solving a problem in mathematics, how likely are you to interpret and understand the problem thoroughly before deciding what to do? [*analytic, general*]

iG1 In solving a problem in mathematics, how likely are you to use the first idea that comes to mind? [*impulsive, general*]

Three measures can be derived from the LtA survey: (a) the analytic subscale is based on the 16 analytic LtA items, (b) the impulsive subscale is based on the 16 impulsive items, and (c) the analytic-impulsive difference is computed based on the difference between the analytic score and the impulsive score for each pair of items.

Open-ended Questionnaire. In this questionnaire, six open-ended questions were posed to uncover participants' initial approaches for solving selected impulsive items in the LtA survey.

Wiest, L. R., & Lamberg, T. (Eds.). (2011). Proceedings of the 33rd Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Reno, NV: University of Nevada, Reno.

The following question, for example, is associated with Item iA3: "What are the first few actions that you would take when asked to solve $(x - 5)(x - 8) = 0$ for x?" Two versions were created to cover the 12 non-general impulsive items (i.e., iA1-iA4, iF1-iF4, and iW1-iW4). The first author and two first-year graduate students coded all the responses in one version. Another team of a full-time research assistant and a final-year doctoral student coded all the responses in the second version. Members from both teams met to analyze the responses in a training set and to discuss general principles for analyzing. The inter-rater reliabilities for the two teams were 0.91 and 0.97 respectively. For each written response, two codes were assigned: (a) disposition code using a five-point scale to indicate whether the response has a strong or weak indication of analytic (A+ or A-) or impulsive (I+, I-) or is inconclusive (U); and (b) correctness code (1 = correct or no indication of misunderstanding, and 0 = presence of misconceptions or non-trivial errors). The analysis of students' written responses was reported in the 2010 PMENA conference (Lim & Mendoza, 2010).

Classification test. The classification test was designed to assess the accuracy in determining whether the act described in each LtA item is analytic or impulsive. For each of the 32 LtA items, participants were asked to label the item as analytic or impulsive, and then to rate whether they were confident or not confident in their answer.

Belief survey. On a 10-point scale (1 = Impulsive; 10 = Analytic), participants were asked which point on the scale best describes their own problem-solving and that of their peers, high-school (HS) math students, HS science students, HS math teachers, and HS science teachers. On a five-point scale (1 = strongly disagree; 5 = strongly agree), participants were asked whether they agree with statements about their problem-solving disposition, the lesson/presentation on impulsive-analytic disposition, and the U.S. mathematics education with regards to impulsive disposition. Listed below are representatives of the statements in the survey.

- I consider myself more impulsive than analytic.
- Today's lesson has helped me appreciate the importance of differentiating between impulsive disposition and analytic disposition.
- U.S. high school mathematics curricula promote impulsive disposition.

Two-part mathematics test. The test was divided into two parts to test the effect of warning about trickiness of problems on performance. The test items in both parts are structurally equivalent. Each part has 12 problems: 6 involving non-proportional situations and 6 involving fractions, ratios, or percents. The problems were designed such that students with an impulsive disposition would be more likely to choose a wrong answer choice. Below are two test items:

- When a candle has burned 23 mm of its original length, its height is 82 mm.
  What is the candle's height when it has burned 46 mm of its original length?
  (a) 41 mm (b) 59 mm (c) 164 mm (d) None of the above
- Benito needs to increase the money he has now by 20% so that he can buy a \$540 laptop. How much more money does he need?
  (a) \$90 (b) \$108 (c) \$432 (d) \$2700.

After completing the first part and before beginning the second part, an example (see Figure 1) was presented to caution participants that "some of the items in this test may be considered 'tricky' for some students."

Consider the following problem:

> John bought a new car this year. If the car depreciates by 20% each year, the car will have depreciated by _______ in two years.
> (a) 30% (b) 36% (c) 40% (d) 64%

Many students choose "c" because 20% plus 20% is 40%, but the correct answer is "b". The actual depreciation in dollar amount in the second year is less than that in the first year because the cost of the car after 1 year is less. For example, suppose the new car costs $10,000. After 1 year, the car's value drops by $2000 (20% of $10000), and it is now worth $8000. In the second year, its value drops by $1600 (20% of $8000). So after 2 years, its value drops by $3600, which is 36% of $10000.

Figure 1: An example to warn students to be cautious prior to working on Part 2

Results and Discussion

Reliability of the Various Measures

The internal consistency reliability estimates for the various measures in each instrument were calculated using Cronbach's alpha. Table 1 presents for each measure the number of items in the measure, the mean value, the standard deviation, the α-value, and the 95% confidence interval. The reliability values for most of the measures are relatively high, except for the Coded-correctness score from the open-ended questionnaire and Part 1 of the mathematics test. The reliabilities for the analytic and impulsive subscales, 0.81 and 0.74 respectively, were greater for this version of the LtA survey than those in the previous version, 0.63 for the 7-item analytic subscale and 0.64 for the 7-item impulsive subscale (Lim et al., 2009).

Table 1: Descriptive and Reliability Measures for the Various Instruments

	No. of Items	Mean	Standard Deviation	Cronbach α	95% Conf. Interval for α
LtA Survey ($N = 119$)					
Analytic Subscale	16	3.96	0.71	0.81	0.76 , 0.86
Impulsive Subscale	16	4.45	0.63	0.74	0.67 , 0.81
Analytic-Impulsive Difference	16	-0.49	0.83	0.77	0.71 , 0.83
Open-ended Questionnaire ($N = 92$)					
Coded-disposition Score	6	1.86	0.31	0.71	0.61 , 0.79
Coded-correctness Score	6	0.77	0.26	0.29	0.38 , 0.49
LtA Classification Test ($N = 92$)					
Classification-accuracy Score	32	0.59	0.12	0.76	0.69 , 0.83
Classification-confidence Score	32	0.75	0.09	0.86	0.81 , 0.90
Belief Questionnaire ($N = 92$)					
Self-disposition Belief[a]	2	2.88	0.38	0.84	0.75 , 0.89
Lesson-on-disposition Opinion[b]	4	4.43	0.05	0.93	0.90 , 0.95
Two-part Math Test ($N = 27$)					
Math-Part1 Score[c]	10	0.28	0.22	0.57	0.28 , 0.76
Math-Part2 Score	12	0.32	0.22	0.67	0.46 , 0.83

[a]The 10-point scale item was transformed into a 5-point scale. The 5-point item was reverse coded.
[b]All the four items about the lesson used a 5-point scale.
[c]Two items had zero variance (all 27 students got them wrong) and were removed from the scale.

A mean value of -0.49 for analytic-impulsive difference indicates that the participants in this study chose lower values for analytic items than for impulsive items in the LtA survey. A mean

value of 1.86 for the coded-disposition score on a 5-point scale (1 = impulsive; 5 = analytic) also indicates that the 92 participants were generally more impulsive than analytic in their open-ended responses. A mean value of 2.88 for the Self-disposition Belief score on a five-point scale, on the other hand, indicates that the participants view themselves as more analytic than impulsive. Mean values of 0.23 (12 items; 0.28 is Table 1 was based on 10 items) and 0.32 (12 items) for the two parts of the math test indicate that the 27 pre-service teachers on average responded correctly to 23% and 32% of the 12 items. These findings suggest that participants are generally more impulsive than analytic although they might view themselves as more analytic than impulsive.

A mean value of 4.43 on a 5-point scale indicates that the participants have a favorable opinion about the lesson on impulsive and analytic dispositions. A mean value of 0.59 for the classification-accuracy score indicates that the 92 participants (Groups 1 and 2) have a 59% accuracy in classifying the 32 LtA items. The 27 participants (Group 3) showed a 9% gain from Part 1 to Part 2, suggesting that students performed better when they were warned to be cautious.

Correlations among the Various Measures

The correlation between the analytic subscale and impulsive subscale was -0.014, not statistically different from zero. In other words, the analytic and impulsive subscales were independent of one another. Interestingly, the difference score between the two subscale scores for each pair of items had a relatively high reliability of 0.77 (see Table 1).

Table 2 presents the correlation between the measures from the LtA survey and other measures that might be related to impulsive-analytic disposition. The disposition scores derived from coding of the six open-ended responses were positively correlated ($r = 0.373$) to the analytic subscale and negatively correlated ($r = -.0488$) to the impulsive subscale. These significant correlations were probably due to the similarity between the items in the open-ended questionnaire and the LtA items. In addition, their initial exposure to the LtA survey first might have influenced their subsequent written responses.

Table 2: Correlations between LtA Subscales and Other Measures

	Analytic Subscale	Impulsive Subscale
Analytic Subscale	1	
Impulsive Subscale	-0.014	1
Analytic-Impulsive Difference	0.745**	-0.678**
Coded-disposition Score	0.373**	-0.488**
Coded-correctness Score	0.256*	-0.205*
Classification-accuracy Score	0.107	-0.286**
Classification-confidence Score	0.183	-0.048
Self-disposition Belief Score	0.418**	-0.275*
Lesson-on-disposition Score	0.011	-0.041
Math-Part1 Score[a]	0.075	-0.205
Math-Part2 Score	0.595**	-0.140

$^{*}p < .05$, $^{**}p < .01$.

Participant accuracy in classifying items was negatively correlated to impulsive subscale ($r = -0.286$) but not correlated to analytic subscale. This finding suggests that students who have an impulsive disposition tended to make more mistakes in classifying items. Participant confidence in their classification was not correlated to either of the LtA subscales.

Participant self-reported disposition score was correlated to both the LtA subscales. The

lesson-on-disposition score was not correlated to either of the LtA subscales.

Participant performance in Part 1 of the mathematics test, prior to the warning, was not correlated to the LtA subscales. On the other hand, student performance in Part 2 was correlated significantly to the analytic subscale but not to the impulsive subscale. This suggests that the warning about problems being tricky had an impact on students with an analytic disposition but not those with an impulsive disposition.

In summary, the two LtA subscales were reliable and uncorrelated. Other measures in the study were reliable and were appropriately associated with the LtA constructs.

Concurrent Validity

In addition to the above analyses, we were also interested in determining whether the LtA subscales could be used to predict the following variables: (a) self-reported GPA, (b) classification-accuracy score, (c) lesson-on-disposition score, (d) Math-Part1 score, and (e) Math-Part2 score. To perform these analyses, a hierarchical multiple regression was performed. In the first step of the multiple regression, variables representing participant characteristics (years of teaching experience, sex, grade band and subject area currently teaching or planning to teach) were entered into the regression model. In the second step, we typically entered the two LtA subscales (except for predicting Math-Part2 score). None of the variables mentioned above could statistically explain variability in self-reported GPA, the lesson-on-disposition score, and the Math-Part1 score. In other words, the LtA scores could not predict these three variables, but the LtA scores did predict classification-accuracy score and the Math-Part2 score.

Predicting Classification-accuracy Score. The variables entered in the first step of the regression model explained 3.3% of variability in the classification-accuracy score. None of these predictors was statistically significant. When the LtA subscales were added, the fraction of variance explained, R^2, increased by 10.3% to 13.6%. The impulsive subscale (β = -.316, p = 0.011) accounted for a significant portion of the variance. In other words, increased impulsivity was associated with worse item classification.

Predicting Math-Part2 score. This regression consisted of four steps instead of two. In the first step, participant sex and indicator variables representing grade band were entered and accounted for 3.5% of variability in the Math-Part2 scores. None of these predictors was statistically significant. In the second step, Math-Part1 score was entered and accounted for an additional 27.8% of variability. Increased Math-Part1 scores were associated with increased Math-Part2 scores (β = .556, p = .010). In the third step, the LtA subscale scores were entered and accounted for an additional 37.8% of variability. Increased analytic disposition (β = .652, p = .000) was associated with increased Math-Part2 scores. In the final step, values representing the interaction between Math-Part1 and the LtA subscales were entered into the regression model. These interactions explained an additional 13.1% of variability. The interaction between Math-Part1 and analytic disposition was statistically significant (β = 1.75, p = .004) in that individuals who had both high Math-Part1 scores and high analytic scores had higher Math-Part2 scores.

Concluding Remarks

The results obtained in this research phase indicate that a measure of problem-solving disposition along the analytic-impulsive dimension could be created using the LtA survey. The LtA scales demonstrated adequate internal consistency reliability. In addition, we found that the analytic and impulsive subscales were independent of one another, replicating the result of an earlier study in the behavioral decision theory on types of decision making styles (Morera et al., 2006).

In this round of data collection, participants were also asked to complete a series of other measures. The analytic and impulsive LtA scores were found to be correlated to certain scores derived from the open-ended questionnaire, the belief survey, and the two-part mathematics test. In particular, the impulsive score was found to be predictive of correctness in classifying the LtA items, and the analytic score was predictive of how well a participant would perform in Part 2 of the math test after the warning, while controlling for the effects of Math-Part 1 scores. In summary, these findings represent a first step in demonstrating the utility of the LtA measures.

The data we obtained were used to refine the LtA survey (see Lim & Mendoza, 2010) and the two-part mathematics test. The revised versions of the two instruments have been administered to more than 450 pre-service teachers. The Barratt Impulsiveness Scale Version 11 questionnaire (Patton et al., 1995), the NfCS questionnaire (Cacioppo & Petty, 1992), and the Cognitive Reflection Test (Frederick, 2005) were administered concurrently to determine how well the LtA survey correlates with these three instruments and how well the LtA scores predict students' performance in the two-part mathematics test.

References

Ben-Zeev, T., & Star, J. R. (2001). Spurious correlations in mathematical thinking. *Cognition and Instruction, 19*, 253–275.

Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. *Journal of Personality and Social Psychology, 42*, 116-131.

Cuoco, A., Goldenberg, E. P., & Mark, J. (1996). Habits of mind: An organizing principle for a mathematics curriculum. *Journal of Mathematical Behavior, 15* (4), 375-402.

Clement, J. (2000). Analysis of clinical interviews: Foundations and model viability. In A. Kelly & R. Lesh (Eds.), *Handbook of research design in mathematics and science education* (pp. 547-589). Mahwah, NJ: Lawrence Erlbaum Associates.

Goldin, G. A. (1998). Observing mathematical problem solving through task-based interviews. In A. Teppo (Ed.), *Qualitative research methods in mathematics education* (pp. 40-62). Reston, VA: National Council of Teachers of Mathematics.

Ericsson, K. A., & Simon, H. A. (1993). Protocol analysis: Verbal reports as data. Revised Edition. Cambridge, MA: MIT Press.

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives, 19* (4), 25-42.

Harel, G. (2008). What is Mathematics? A pedagogical answer to a philosophical question. In R. B. Gold & R. Simons (Eds.), *Current issues in the philosophy of mathematics from the perspective of mathematicians*. Mathematical American Association.

Kagan, J., Rosman, B. L., Day, D., Albert, J., & Phillips, W. (1964). Information processing in the child: Significance of analytic and reflective attitudes. *Psychological Monographs, 78* (1, Whole No. 578).

Lim, K. H. (2006). *Students' mental acts of anticipating in solving problems involving algebraic inequalities and equations*. Ph.D. dissertation, University of California, San Diego and San Diego State University, United States. (Publication No. AAT 3222037). Published as a book in 2008 by VDM Verlag Dr. Müller.

Lim, K. H. (2009). Burning the candle at just one end: Using nonproportional examples helps students determine when proportional strategies apply. *Mathematics Teaching in the Middle School, 14*(8), 492-500.

Lim, K. H., & Mendoza, M. (2010). Inferring impulsive-analytic disposition from written

responses. In P. Brosnan, D. B. Erchick, D. B. & L. Flevares, L. (Eds.), *Proceedings of the Thirty-second Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 759-767). Columbus, OH.

Lim, K. H., Morera, O., & Tchoshanov, M. (2009). Assessing problem-solving dispositions: Likelihood-to-act survey. In S.L. Swars, D.W. Stinson & S. Lemons-Smith (Eds.). *Proceedings of the Thirty-first Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 700-708). Atlanta: Georgia State University.

Luchins, A. S. (1942). Mechanization in problem solving: The effect of Einstellung. *Psychological Monographs, 54* (6, Whole No. 248).

Morera, O. F., Maydeu-Olivares, A., Nygren, T. E., White, R. J, Fernandez, N. P., & Skewes, M. C. (2006). Social problem solving predicts decision making styles in a U.S. Hispanic sample. *Personality and Individual Differences, 41*, 307-317.

Nietfeld, J., & Bosma, A. (2003). Examining the self-regulation of impulsive and reflective response styles on academic tasks. *Journal of Research in Personality, 23*, 118-140.

Patton, J. M., Stanford, M. S., & Barratt E. S. (1995). Factor structure of the Barratt Impulsiveness Scale. *Journal of Clinical Psychology, 51*, 768-774.

Schoenfeld, A. (1992). Learning to think mathematically: Problem solving, metacognition, and sense making in mathematics. In D. A. Grouws (Ed.), *Handbook of research on mathematics teaching and learning* (pp. 334-370). New York: Macmillan.